

Coal Mine Methane

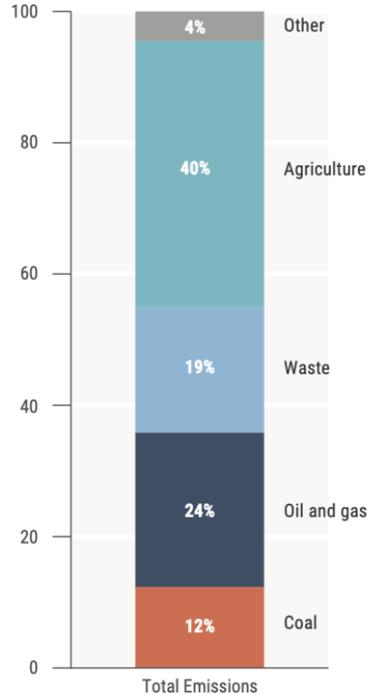
Data Survey: Sources, Availability, Reliability

Ryan Driskell Tate, Ph.D.
Global Energy Monitor

December 6 2021
United Nations Economic Commission for Europe
(UNECE)



Why collect CMM emissions data?

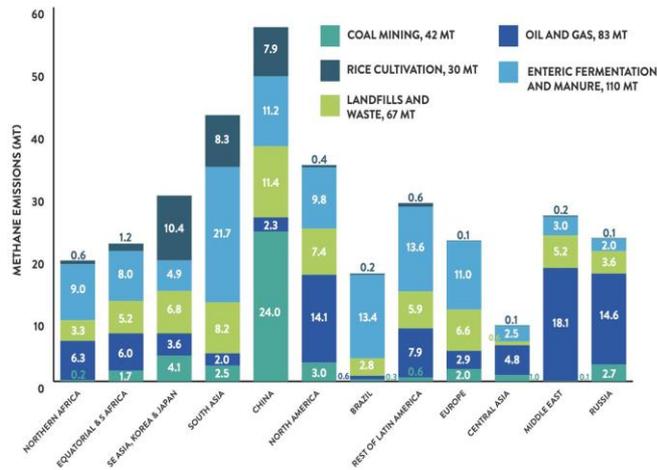


Global methane emissions sources
Source: Global Methane Assessment Report (2021)

- Measurements are key to the evaluation of workplace safety, methane recovery projects, and mitigation and reduction efforts.
- A lack of data creates potential for uncertainty and underreporting.
- Uncertainty hampers accurate estimates of emissions, project feasibility, mitigation strategies, and proper regulatory intervention.



Availability: Who is collecting CMM data?



Estimated annual sectoral methane emissions by region and global sector totals (Mt) Source: Saunio et al. (2020)

- **Companies:** Mine owners and operators and CMM project developers.
- **Governments:** National inventories of emissions (e.g. submissions to the UNFCCC, EU GHG Inventory, etc.)
- **Third parties:** Remote sensing industry data, International agencies and bodies (e.g. Global Methane Initiative, IEA), academic studies, civil society organizations (GEM, Ember)



Sources: What kind of CMM data?



Coal mine methane from a vent stack, Source: Global Methane Initiative.

- **Companies:** Mine-specific activity level measurements (e.g. (1) gas composition; (2) methane vented and methane drained (and percent); (3) specific emissions ($\text{m}^3 \text{Ch}_4/\text{t}$); (4) historical emissions (a time series); (5) gas resource assessments).
- **Governments:** National emissions estimates (generally a mixture of self-reported company data and estimates using “outside the fenceline” IPCC Tier 1 and Tier 2 guidelines).



Sources: What kind of CMM data?



Source: Kayrros, Methane Watch (2021)

- **Remote sensing industry:** a “bird’s eye view” of emissions detected at site level via drones and satellites (e.g., TROPOMI, GHGSat, MethaneSAT, GoSat and others).
- **Academic research:** scientific studies using various emissions models, generally for global or national level inventories.
- **Global agencies:** Mixture of site level data and national inventories (e.g. GMI, IEA).
- **Civil society organizations:** Public data collection and emissions modeling (e.g. GEM’s Global Coal Mine Tracker).



Reliability: Quality of CMM data?

Method	Source	Uncertainty	References
Tier 1	Mining emissions	Factor of 2 greater or smaller	Expert judgment (GPG, 2000)
	Post-mining emissions	Factor of 3 greater or smaller	Expert judgment (GPG, 2000)
Tier 2	Mining emissions	$\pm 50\text{-}75\%$	Expert judgment (GPG, 2000)
	Post-mining emissions	± 50	Expert judgment (GPG, 2000)
Tier 3	Drainage gas – spot measurements of CH ₄	$\pm 2\%$	Expert judgment (GPG, 2000)
	Drainage gas – degasification flows	$\pm 5\%$	Expert judgment (GPG, 2000)
	Ventilation gas – continuous or daily measurements	$\pm 5\%$	Expert judgment (GPG, 2000)
	Ventilation gas – spot measurements every 2 weeks	$\pm 10\%$	Mutmansky and Wang, 2000
	Ventilation gas – spot measurements every 3 months	$\pm 30\%$	Mutmansky and Wang, 2000

Estimates of uncertainty for underground mining for Tier 1 and Tier 2 (emission factors) and Tier 3 approaches. Source: IPCC (2019).

- Systematic measurement of emissions is preferable to estimates.
- All emissions estimates have degrees of uncertainty.



Reliability: Challenges of CMM data?

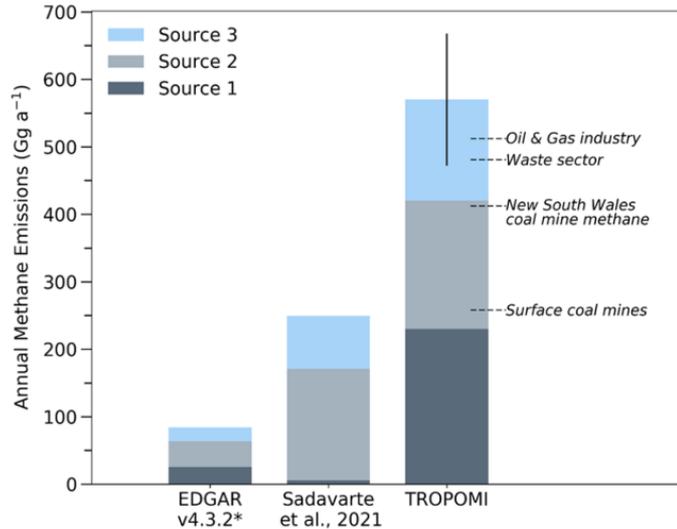


Source: Global Methane Initiative

- Site-level measurements have the lowest level of uncertainty, but data can be costly to collate and maintain and is limited by calibration and operator experience.
- National inventories mix-and-match Tier 1 and Tier 2 IPCC methodologies, creating discrepancies in international reporting.



Reliability: Challenges of CMM data?



Source: Sadavarte et. al. (2021)

- Remote sensing often lacks time series data and site-level information and risks allocating to the wrong source.
- Government, academic, civil society, and industry work is limited by public data accessibility and lack of raw data.
- Academic research using “top down” and “bottom up” emissions inventories has exposed discrepancies and uncertainties of each methodology.



Coal Mine Methane Tracking



Source: Global Energy Monitor, Global Coal Mine Tracker (2021)

- Global Energy Monitor is working to help resolve emissions discrepancies and meet data challenges.
- We use our Global Coal Mine Tracker to document mine-level data, including methane emissions.
- When emissions information is unavailable, we use production, coal type, methane content at operating depth, and location information to estimate those emissions.
- We encourage transparency and public reporting.
- Our data is available under CC BY-NC-SA 4.0.

